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10/788,700

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Sidlgata V. Sreenivasan

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EXAMINER

DANIELS, MATTHEW J

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/788,700	Applicant(s) SREENIVASAN, SIDLGATA V.	
	Examiner MATTHEW J. DANIELS	Art Unit 1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 August 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,5-9,11,13,15-17,19 and 24-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3,5-9,11,13,15-17,19 and 24-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

1. **Claims 27-29** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. There is no indication or description in the specification that the instant invention was designed to exclude printing ink.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. **Claims 1, 3, 5, 6, 8, 24, and 27** are rejected under 35 U.S.C. 103(a) as being unpatentable over Sreenivasan (US 2005/0051698) in view of Choi (US 2002/0094496). **As to Claim 1**, Sreenivasan teaches a method of forming a material layer on a substrate, said method comprising:

forming a plurality of flowable material on the substrate (Fig. 1, [0005]);

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contacting said material in the flowable regions with an imprint lithography mold having a three dimensional relief pattern (Figs. 1-6) causing the material to conform to the relief pattern;

inducing localized sections of the template to flex by urging the template to conform to the topography of a substrate, wherein the flexing of various regions would be obviously different (Fig. 7);

solidifying the material to provide a three-dimensional pattern conforming to a three-dimensional relief pattern;

wherein multiple regions of the mold have features that facilitate the flexing of localized regions of the template (206).

Sreenivasan is silent to physically separate imprint lithography molds disposed on one template. However, Choi teaches physically separate features or molds (Fig. 4, item 401) which appear to be physically separate on the imprint lithography template.

It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Choi into that of Sreenivasan because (a) the Choi process represents an improvement by allowing for fabrication of separate features, and one would have found it obvious to incorporate this aspect of the Choi process into the Sreenivasan method in order to produce the distinct features suggested by Sreenivasan in Fig. 10, or (b) Sreenivasan suggests separate features (Fig. 9, item 208, Fig. 10, [0034]), and Choi provides an apparatus for fabricating separate features (Fig. 4). **As to Claim 3**, in the combination of Choi with Sreenivasan, confinement of the material in a defined area would have been obvious using the Choi configuration (Fig. 4). **As to Claims 5 and 6**, the process of Sreenivasan would obviously utilize the flexing portions (Fig. 8, item 206) in order to conform to a substrate (Fig. 9)

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and application of radiation (Fig. 1, item 22). **As to Claim 8**, in the Sreenivasan process, each of the plurality of flowable regions appears to be spaced apart from other flowable regions (Fig. 1). **As to Claim 24**, in combination with the mold configuration of Choi, Sreenivasan would provide physically separated imprinted portions. **As to Claim 27**, the Sreenivasan process would obviously utilize photoresist ([0028]).

3. **Claim 2** is rejected under 35 U.S.C. 103(a) as being unpatentable over Sreenivasan (US 2005/0051698) in view of Choi (US 2002/0094496), and further in view of Colburn (Doctor of Philosophy dissertation, University of Texas at Austin, 2001) **As to Claim 2**, Sreenivasan is silent to the one to one correspondence between flowable regions and molds. However, it is submitted that variation in the number of droplets (Colburn) or the number of patterning regions (Choi) would have been obvious. For example, Choi teaches in at least one embodiment the use of four patterning regions, and Colburn teaches the use of four droplets (Fig. 3.11). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Colburn into that of Sreenivasan because (a) Sreenivasan suggests droplets ([0026]), which Colburn provides, or (b) the process of Colburn represents an improvement in that it reduces the imprinting force, and one would have found it obvious to incorporate this into the Sreenivasan process in order to similarly reduce the imprinting force.

4. **Claims 7-9, 11, 13-15, 27, and 28** are rejected under 35 U.S.C. 103(a) as being unpatentable over Colburn (Doctor of Philosophy dissertation, University of Texas at Austin, 2001) in view of Choi (US 2002/0094496) and Chou (USPN 6482742). **As to Claims 7, 9, and**

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16, Colburn teaches a method, which is used or could be used in an imprint lithography system, for forming a layer on a substrate (page 22, Fig. 2.1, (4)), the method comprising:

Forming a plurality of flowable regions on a substrate (page 55, section 3.4);

Contacting the flowable regions with a plurality of molds disposed on a template (pages 55-58); and

Solidifying the plurality of flowable regions (page 22, Fig. 2.1).

Colburn is silent to (a) the plurality of imprint lithography molds having three dimensional relief patterns resulting in the flowable regions conforming to the three dimensional relief patterns so that the plurality of flowable regions maintain three dimensional patterns conforming to the three dimensional relief patterns, and (b) contacting further including flexing the template to conform to a topography of a substrate.

However, these aspects of the invention would have been obvious for the following reasons:

(a) Choi teaches a plurality of imprint molds having three dimensional relief patterns (Fig. 4, item 401, Fig. 6). For example, in Fig. 4, each patterning region (item 401) is analogous to items 40, 42, 44, and 46 in Fig. 10 of the instant application. Choi describes the channels between the patterning region as “entrainment channels” which entrain excess fluid and prevent it from spreading to adjacent patterning areas through its greater depth than the patterning area ([0090]-[0091]). In combination with the droplets of Colburn, the Choi template would prevent spreading of the resist to the adjacent patterning areas.

(b) Chou teaches it is desirable to provide a flexible mold and substrate such that the mold and substrate will conform despite deviations from planarity (3:33-38) by application of fluid

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pressure to press the mold into the surface (3:50-67). Additionally note the Choi also suggests that such compressible molds are known ([0087]). Since the whole mold of Chou would flex, it would obviously flex in the regions between adjacent molds.

It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the methods of Choi and Chou into that of Colburn for the following reasons:

(a) The Choi process and the Colburn process are both imprint lithography techniques, and even more specifically, both disclose step and flash imprint lithography techniques. The combination merely provides the use of a known technique (Choi's entrainment channels) with a similar process (Colburn) in the same way and to provide the same predictable result, namely that excess fluid is prevented from spreading to adjacent patterning areas through the use of entrainment channels having a depth greater than the patterning area (Choi, [0090]-[0091]).

(b) The Chou technique is similar to the Colburn process (both imprint lithography techniques) but provides an additional improvement that the mold conforms to the substrate, to produce the expected effect that the resulting surface would be more uniform. In view of the similar nature of the Chou technique and the Colburn process, one of ordinary skill would have found it obvious to apply this known technique (of Chou) to the Colburn process to achieve the same results, namely improved uniformity of the resulting surface.

As to Claims 11 and 17, it is submitted that variation in the number of droplets (Colburn) or the number of patterning regions (Choi) would have been obvious, however, Choi teaches in at least one embodiment the use of four patterning regions, and Colburn teaches the use of four droplets (Fig. 3.11). **As to Claims 13 and 19**, Colburn solidifies by applying UV

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light (page 22). **As to Claims 15, 25, and 26**, because Colburn teaches that the value of the multi-droplet compression is lost when all droplets coalesce (page 58) and in view of the entrainment regions of Choi, confining of the material of the plurality of flowable regions to each patterning region would have been obvious. **As to Claims 28 and 29**, since Colburn and Choi each teach step and flash imprint lithography, the photoresist would not include printing ink.

Response to Arguments

5. Applicant's arguments filed 27 August 2008 have been fully considered but they are not persuasive. The arguments appear to be on the following grounds:

- a) Imprint lithography will not work with printing ink, which does not polymerize under UV light. 10/463,396 also excludes printing ink.
- b) The Colburn template would break if flexed.
- c) Choi teaches a template having multiple patterned areas. The entrainment channels allow excess fluid to escape.
- d) Chou describes a single mold where the entire mold is flexible. Claim 1 now describes features around each mold which allow localized flexing of the templates.
- e) Claim 7 requires concurrent forming of the flowable regions, and provides unexpected results not suggested by the prior art when performed over a large area.
- f) Limitations of Claim 20 have been incorporated into Claim 16. Colburn is silent to flexing and teaches away from flexing.
- g) The office action did not address claims 24-26.

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6. Response:

a) There is no support in the specification as originally filed for the exclusion of printing ink.

The Examiner maintains the position set forth previously. There also appears to be no exclusion of printing ink in 10/463,396.

b,f) Applicants' arguments appear to suggest that despite teaching of flexible templates and the benefits of such templates in processes such as Sreenivasan and Chou, one would simply be motivated only to continue practicing the Colburn process with rigid templates which would provide a lesser degree of conformance to the substrate. The Examiner respectfully disagrees. One having knowledge of the Colburn process and subsequent developments or improvements in the field would recognize that the Colburn template could be replaced with a flexible template in order to better conform to the substrate. Teaching of a template in the Colburn process which may be rigid is not interpreted to be a teaching from all templates which are not rigid.

c,g) It is submitted that the configuration proposed by Choi would separate various portions to provide separated layers of imprinted material. Claims 24-26 are addressed on page 6 of the 27 May 2008 office action, and it is noted that the benefits of nanoimprinting or SFIL for device fabrication would largely be lost or absent if all imprinted regions were necessarily connected (in other words, unconfined and not physically separated).

d) Note that Sreenivasan has the claimed features, which appear only in Claim 1. Other claims (for example, Claim 16) recite merely that the template is flexed, which is not distinguishable from the flexing of Chou which flexes everywhere, including between adjacent portions.

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e) The argument is not commensurate with the claim, which does not require any particular wafer size. Nevertheless, the argument is drawn to an obvious combination of steps (simultaneous deposition of droplets), which does not appear to provide any nonobvious result.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW J. DANIELS whose telephone number is (571)272-2450. The examiner can normally be reached on Monday - Friday, 8:00 am - 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christina Johnson can be reached on (571) 272-1176. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Matthew J. Daniels/
Primary Examiner, Art Unit 1791
11/24/08